IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	:	
Persson et al.	:	Attorney Docket: 43315-212951
Application No.: 09/857,348	:	Art Unit: 3679
Filed: July 24, 2001	:	Examiner: V. Macarthur
For: ROBOT DEVICE	:	

BRIEF ON APPEAL

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

This brief is submitted pursuant to the notice of appeal filed August 5, 2008, and in response to the Notification of Non-Compliant Appeal Brief mailed February 17, 2009.

Real Party In Interest

The real party in interest in this appeal is the assignee, ABB AB, SE-721 83, Västerås, Sweden, by virtue of an assignment from the inventors to ABB AB, which was recorded in the U.S. Patent and Trademark Office on September 17, 2002, at reel 013302, frame 0280.

Related Appeals and Interferences

Applicants are unaware of any related appeals or interferences which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

Status of Claims

Claims 1-22, 25, 29, 31, and 34 are cancelled. Applicants appeal the final rejection of claims 23, 24, 26-28, 30, 32, 33, and 35-39.

Status of Amendments

Applicants have not submitted any amendments to the claims subsequent to the issuance of the final office action. Applicants have submitted one sheet of corrected drawings to illustrate add the indication of cross-section to Figs. 4(a) and 4(b). Applicants are unaware of the status of this amendment.

Summary of Claimed Subject Matter

The invention recited in independent claim 38 includes a delta robot (page 2, lines 14-16). A multi-link system including a plurality of rods and a plurality of joints is arranged at the ends of the rods (page 1, lines 7-8; page 2, lines 14-16; and Fig. 4(a)). Each joint includes a joint ball , a joint bearing 3 engaging the joint ball, and a joint socket 1 including a joint housing 4 enclosing the joint bearing (page 3, lines 14-17; Figs. 1-4(b)). The joint socket extends about the joint ball approximately one-half the joint ball or less (page 3, lines 15-16; Fig. 4(a)). The joint bearing includes at least one removable polymeric friction minimizing annular bearing member arranged easily replaceable to eliminate uneven wear in the joint (page 2, lines 18-21; page 3, lines 16-17 and 22-24; and Figs. 1, 4(a) and 4(b)). The bearing member includes a bearing surface engaging only the approximately one-half of joint ball or less (page 3, lines 15-16; Fig. 4(a)). The joint housing includes a housing surface against which a side surface of the bearing member abuts (page 3, lines 22-23; and Figs. 1-4(b)). The joint housing extends about the joint ball approximately one-half the joint ball or less (page 3, lines 15-16; Fig. 4(a)). The housing surface includes a plurality of friction-increasing grooves extending in a longitudinal direction of the housing surface (page 3, lines 24, through page 4, line 2; and Figs. 3 and 4(b)). The grooves engage the side surface of the at least one bearing member and are operative to increase friction between the at least one bearing member and the housing surface to rotationally immobilize the at least one bearing member in the housing during operation of a driving means (page 3, lines 24, through page 4, line 2; and Figs. 3 and 4(b)). Fig. 5 illustrates and example of a delta robot. The driving means is arranged in the structure at the top of the robot from which the arms extend.

(*See* page 1, lines 12-14.)

Claim 23, which depends from claim 38, recites that the grooves may be aligned at an angle with respect to a longitudinal axis of the bearing member (page 3, lines 27-29; and Fig. 3).

As recited in claim 24, which depends from claim 38, the grooves may be narrower with increasing distance from the bearing member (page 3, line 30; and Fig. 4(b)).

According to claim 26, which depends from claim 38, the grooves may penetrate the bearing member (page 3, line 31, through page 4, line 2; and Fig. 4(b)).

As recited in claim 27, which depends from claim 38, the housing and the bearing member may each have a socket shape (page 4, lines 10-13; and Fig. 4(b)).

Claim 28, which depends from claim 38, recites that the at least one bearing member may be pressed to fit tightly in the housing (page 3, lines 22-24; page 4, lines 11-13; and Figs. 1-4(b)).

The invention recited in independent claim 39 includes a method for forming a delta robot operative to position a movable element in relation to a fixed element (page 2, lines 14-16; and page 3, lines 14-15). A plurality of linkage structures are provided (page 2, lines 14-26; and page 3, lines 14-15). Each linkage structure includes a plurality of pull rods and a plurality of joints arranged at the ends of the rods (page 1, lines 7-8; page 2, lines 14-16; and Fig. 4(a)). Each joint is provided with a joint ball (page 3, lines 14-17; Figs. 1-4(b)). A joint bearing

engaging the joint ball is provided (page 3, lines 14-17; Figs. 1-4(b)). The joint bearing includes a bearing surface engaging only approximately one-half of joint ball or less (page 3, lines 15-16; Fig. 4(a)). A joint socket 1 is provided including a joint housing 2 enclosing the joint housing (page 3, lines 14-17; Figs. 1-4(b)). The joint socket and the joint housing extend about the joint ball the approximately one-half the joint ball or less (page 3, lines 15-16; Fig. 4(a)). Providing the joint bearing includes arranging in the joint housing at least one removable polymeric friction minimizing annular bearing member arranged easily replaceable to eliminate uneven wear in the joint (page 2, lines 18-21; page 3, lines 16-17 and 22-24; and Figs. 1, 4(a) and 4(b)). The joint housing includes a housing surface against which a side surface of the bearing member abuts (page 3, lines 22-23; and Figs. 1-4(b)). The housing surface includes a plurality of friction-increasing grooves extending in a longitudinal direction of the housing surface (page 3, lines 24, through page 4, line 2; and Figs. 3 and 4(b)). The grooves engage the side surface of the at least one bearing member and are operative to increase friction between the at least one bearing member and the housing surface to rotationally immobilize the at least one bearing member in the housing during operation of a driving means (page 3, lines 24, through page 4, line 2; and Figs. 3 and 4(b)). Fig. 5 illustrates and example of a delta robot. The driving means is arranged in the structure at the top of the robot from which the arms extend. (*See* page 1, lines 12-14.)

As recited in claim 30, which depends from claim 39, the method may fix a location of the bearing member in the robot (page 4, lines 13-14).

According to claim 32, which depends from claim 39, the grooves may be aligned at an angle with respect to a longitudinal axis of the bearing member (page 3, lines 27-29; and Fig. 3).

Claim 33, which depends from claim 39, recites that the grooves may be narrower with increasing distance from the bearing member (page 3, line 30; and Fig. 4(b)).

According to claim 35, which depends from claim 39, the grooves may penetrate the bearing member (page 3, line 31, through page 4, line 2; and Fig. 4(b)).

As recited in claim 36, which depends from claim 39, the housing and the bearing member may each have a socket shape (page 4, lines 10-13; and Fig. 4(b)).

Claim 37, which depends from claim 39, recites that the at least one bearing member may be pressed to fit tightly in the housing (page 3, lines 22-24; page 4, lines 11-13; and Figs. 1-4(b)).

Grounds Of Rejection To Be Reviewed On Appeal

I. The Examiner rejected claims 23-28, 30, and 32-39 under 35 U.S.C. § 103(a) as being unpatentable over U.S. patent 4,976,582 to Clavel in view of U.S. patent 2,733,085 to Latzen and U.S. patent 4,430,016 to Matsuoka.

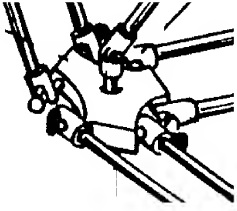
Argument

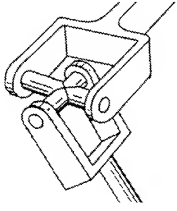
I. Claims 23-28, 30, and 32-39 under 35 U.S.C. § 103(a) as being unpatentable over U.S. patent 4,976,582 to Clavel in view of U.S. patent 2,733,085 to Latzen and U.S. patent 4,430,016 to Matsuoka.

The combination of Clavel, Latzen and Matsuoka does not suggest the invention recited in claims 38 or 39, since, among other things, the combination does not suggest a joint socket and joint housing enclosing a joint ball with a space approximately one-half the ball or less. The combination also does not suggest a ball and socket joint that includes a bearing member that engages only a distal half of each joint ball or only a portion of the distal half of each joint ball and only a portion of a proximal half of each joint ball.

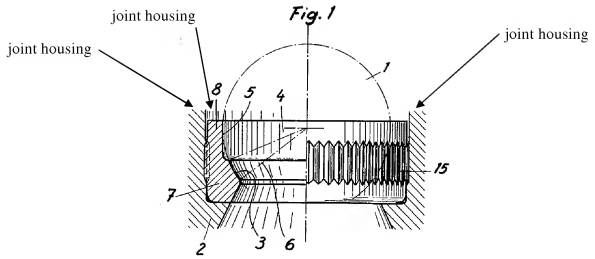
Clavel does not suggest the ball and socket joint according to the claimed invention. Below are reproduced the joints suggested by Clavel. As can be seen in both of these views, Clavel suggests cardan joints, which are multi-element linkages. Clavel describes these joints as col. 4, lines 13-17. Cardan joints are couplings using a double yoke and four-point center cross.

Cardan joints are used as couplings in the driveshafts of rear-wheel drive cars, but can produce uneven shaft speeds when operated at joint angles of more than a few degrees. Cardan joints include many moving parts that result in inherent high friction and complexity in changing any parts. Such a joint does not suggest the ball and socket joint of the claimed invention.





Latzen suggests joints that virtually completely envelop the ball. One example of such a joint is shown in Fig. 1, which is reproduced below. It is important to recognize that Fig. 1 and the other figures illustrate cut-away views of the joints, as indicated in by the arrows in Fig. 1 as reproduced below, and that the joint housing 2 extends about the entire ball head. Fig. 2 illustrates a similar view and Figs. 3 and 4 illustrate a non-cut away views of the housing almost entirely surrounding the ball.



Such joint housing that surrounds more that approximately one-half of the joint ball is contrary to the claimed invention. Including such joints in a robot according to the claimed invention would severely limit the operation of the robot for a number of reasons. The joints suggested by Latzen would have much higher friction and simply physically limit the movement of the ball and socket relative to each other. Additionally, it would be quite complicated and not at all obvious to replace the bearing member of the joint suggested by Latzen as is possible to replace the bearing member according to the claimed invention.

To interpret the cut-away view of Latzen as suggesting a structure that does surrounds one-half of a ball joint or less consciously ignores the contents of the written description and drawings of Latzen. Simply because a cut-away view does not illustrate elements of an invention does not mean that the elements not shown in the cut-away view do not exist. It is a creation of the Examiner that structures not shown in the cut-away views do not exist. The cut-away views clearly do not show the claimed structure since the parts not shown in the cut-away views are still present. Latzen does not "intend" for the housing to entirely surround the ball of

the joint, the ball is entirely surrounded by the structure. Latzen has chosen not to illustrate the entire structure in the drawing. The interpretation of the figure by the Examiner is unfounded in the specification and drawings and does not exist. The feature is not shown, not intended to be shown and not explained; the feature does not exist.

In view of the above, Clavel concretely defines and illustrates the joints that are utilized in the robot. It is not apparent how such a joint could be replaced with the limited motion joint suggested by Latzen. Nor is it clear how such a combination suggests the claimed invention.

Matsuoka et al. similarly suggests a socket structure that entirely surrounds the ball.

The arrangement of the claimed invention minimizes friction and provides the delta robot with a desired degree of freedom of movement of the delta robot. Additionally, the claimed invention provides a low weight design that can have a stroke time of about 0.5 sec. The claimed invention also provides an easily replaceable bearing means that may be exchanged regularly to achieve minimized uneven wear.

The joint socket of the invention recited in claims 38 and 39 encloses the joint ball with a space approximately one-half the ball or less. Such a structure permits quick disassembly of the joint and change of the bearing member. Since the socket structure of both Latzen and Matsuoka et al. surround the ball of the ball and socket joint, not only would the structures not provide the degree of movement possible with the structure according to the claimed invention, but they would also not provide the possibility to easily disassemble the joint and quickly change the

bearing member.

By only enclosing approximately one-half of the ball or less the invention recited in claims 39 and 39 provides minimal friction in the joint, which helps to provide the robot with a quick stroke time, which may be on the order of about 0.5 seconds. In spite of only covering approximately one-half of the ball or less, the claimed invention the bearing member is firmly fixed in the socket of the joint, such that the joint can withstand the rotational and directional movements that such joints encounter in use.

These features and advantages result from structural differences that the cited references do not suggest. The cited references do not suggest these features and combining the references, which do not the structural features recited in the claims, does not suggest the claimed invention. The results achievable with the structure of the claimed invention, such as the wide range of movement of the ball in the socket of the joint, result from structural differences between the invention and the cited references. As discussed above, the cited references do not suggest the claimed elements of the invention.

In view of the above, the combination of Clavel, Latzen and Matsuoka does not suggest the invention recited in claims 38 or 39 or claims 23, 24, 26-28, 30, 32, 33, and 35-37, which depend from claim 38 or 39. Therefore, the invention recited in claims 23, 24, 26-28, 30, 32, 33, and 35-39 is not obvious in view of the combination of Clavel, Latzen and Matsuoka. Accordingly, Applicants respectfully request reversal of this ground of rejection.

Conclusion

In view of the above, the combination of U.S. patent 4,976,582 to Clavel in view of U.S. patent 2,733,085 to Latzen and U.S. patent 4,430,016 to Matsuoka does not suggest patentable features of the claimed invention. Therefore, the combination of Clavel, Latzen and Matsuoka does not make the claimed invention obvious. Accordingly, Applicants submit that the claimed invention is patentable over the combination of Clavel, Latzen and Matsuoka and respectfully request reversal of the rejection and issuance of the Notice of Allowance.

The undersigned authorizes the Commissioner to charge insufficient fees and credit overpayment associated with this communication to Deposit Account No. 22-0261.

Date: March 19, 2009

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Appendix A

Claims On Appeal

23. The delta robot according to claim 38, wherein the grooves are aligned at an angle with respect to a longitudinal axis of the bearing member.

24. The delta robot according to claim 38, wherein the grooves are narrower with increasing distance from the bearing member.

26. The industrial robot according to claim 38, wherein the grooves penetrate the bearing member.

27. The industrial robot according to claim 38, wherein the housing and the bearing member each have a socket shape.

28. The industrial robot according to claim 38, wherein the at least one bearing member is pressed to fit tightly in the housing.

30. The method according to claim 39, wherein the method fixes a location of the bearing member in the robot.

32. The method according to claim 39, wherein the grooves are aligned at an angle with

respect to a longitudinal axis of the bearing member.

33. The method according to claim 39, wherein the grooves are narrower with increasing distance from the bearing member.

35. The method according to claim 39, wherein the grooves penetrate the bearing member.

36. The method according to claim 39, wherein the housing and the bearing member each have a socket shape.

37. The method according to claim 39, wherein the at least one bearing member is pressed to fit tightly in the housing.

38. A delta robot, comprising:

a multi-link system including a plurality of rods and a plurality of joints arranged at the ends of the rods,

each joint comprising a joint ball, a joint bearing engaging the joint ball, and a joint socket comprising a joint housing enclosing the joint bearing,

the joint socket extending about the joint ball approximately one-half the joint ball or less,

the joint bearing comprising at least one removable polymeric friction minimizing annular bearing member arranged easily replaceable to eliminate uneven wear in the joint,

the bearing member comprising a bearing surface engaging only the approximately one-half of joint ball or less,

the joint housing comprising a housing surface against which a side surface of the bearing member abuts, the joint housing extending about the joint ball approximately one-half the joint ball or less, the housing surface comprising a plurality of friction-increasing grooves extending in a longitudinal direction of the housing surface, the grooves engaging the side surface of the at least one bearing member and being operative to increase friction between the at least one bearing member and the housing surface to rotationally immobilize the at least one bearing member in the housing during operation of a driving means.

39. A method for forming a delta robot operative to position a movable element in relation to a fixed element, the method comprising:

providing a plurality of linkage structures, each comprising a plurality of pull rods and a plurality of joints arranged at the ends of the rods;

providing each joint with a joint ball;

providing a joint bearing engaging the joint ball, the joint bearing comprising a bearing surface engaging only approximately one-half of joint ball or less;

providing a joint socket including a joint housing enclosing the joint housing, the joint socket and the joint housing extending about the joint ball the approximately one-half the joint ball or less;

wherein providing the joint bearing comprises arranging in the joint housing at least one removable polymeric friction minimizing annular bearing member arranged easily replaceable to eliminate uneven wear in the joint, wherein the joint housing comprising a housing surface

against which a side surface of the bearing member abuts, the housing surface comprising a plurality of friction-increasing grooves extending in a longitudinal direction of the housing surface, the grooves engaging the side surface of the at least one bearing member and being operative to increase friction between the at least one bearing member and the housing surface to rotationally immobilize the at least one bearing member in the housing during operation of a driving means.

Appendix B

Evidence Appendix

None

Appendix C

Related Proceedings Appendix

None